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	First Named Inventor	Charles Leu	
	Art Unit	2872	
	Examiner Name	JOSHUA L PRICHETT	
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Firm or Individual name	Wei Te Chung Foxconn International, Inc.
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Date	Aug 2, 2002

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PATENT

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicant:

Leu et al.

Serial No: 10/044,268

Filed: 01/08/2002

For: INDIUM-TIN OXIDE THIN FILM  
FILTER FOR DENSE WAVELENGTH  
DIVISION MULTIPLEXING

) Examiner:  
) Joshua L Pritchett  
)  
) Group Art Unit: 2872  
)  
) Dated: Sep. 7, 2004  
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**REQUEST FOR REINSTATEMENT OF APPEAL**

Assistant Commissioner of Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

In response to the final office action dated June 4, 2004, Applicant respectfully requests "reinstatement of the Appeal" with submission of the supplemental appeal brief. No fee is required.

Respectfully submitted,  
Charles Leu et al

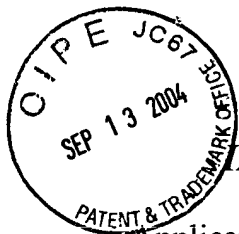
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PATENT

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicant:

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Serial No: 10/044,268

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For: INDIUM-TIN OXIDE THIN FILM  
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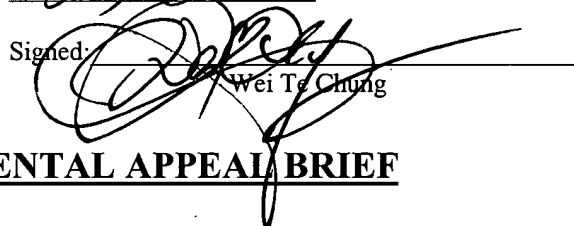
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Wei Te Chung

**SUPPLEMENTAL APPEAL BRIEF**

Assistant Commissioner of Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

Appellant appealed from the final rejection of claims 1-3 and 7-14 contained  
in the Office action of Jun. 4, 2004.

## **RELATED APPEALS AND INTERFERENCES**

There are no related appeals or interferences that will be affected by the Board's decision in this appeal.

## **STATUS OF CLAIMS**

Claims 1-3 and 7-14 comprise all currently pending claims, and all these claims stand rejected. Claims 4-6 have been canceled. Claims 1 and 11 are independent claims. The rejection of claims 1-3 and 7-14 is appealed herein.

## **STATUS OF AMENDMENTS**

An amendment filed on July 20, 2004 after a final rejection dated Jul. 04, 2004 would be entered for purposes of Appeal.

## **SUMMARY OF THE INVENTION**

The invention comprises a DWDM thin film filter comprising a substrate (11) and a film stack (12). The film stack (12) comprises a plurality of cavities (13). Each cavity comprises a first group of mirror layers (21), a second group of mirror layers (22), and a spacer layer (23) (see specification page 4, lines 9-11, and FIGS. 1 & 2). Each group of mirror layers (21, 22) comprises a plurality of high refractive index thin films (31) and low refractive index thin films (32) alternately deposited one on another (see specification page 4, lines 19-22, and FIG. 2). The material of the high refractive index films (31) is a composition of indium-tin oxide (see specification page 5, lines 9-10).

The feature of the invention is to provide a thin film stack of a DWDM thin film filter not only having relatively few layers of film and less internal stress but

also being relatively simple and inexpensive to manufacture. Additionally, the DWDM thin film filter is relatively resistant to failure during manufacture and in use (see specification page 2, lines 16-17).

### **ISSUES PRESENTED FOR REVIEW**

The grounds of rejection given in the final Office action dated Jun. 04, 2004 were that the subject matter of claims 1 and 11 was unpatentable under 35 U.S.C. 103(a) over Pelekaty(US 6,215,592) in view of Rancourt (US 4,846,551); the subject matter of claim 7 was unpatentable under 35 U.S.C. 103(a) over Pelekaty in view of Rancourt and Mitsui (US 6,042,752); and the subject matter of 2-3, 8-10 and 12-14 was unpatentable under U.S.C. 103(a) Pelekaty in view of Rancourt and Adair (US 6,490,381).

The sole issue presented for review is whether the subject matter of claims 1 and 11 is patentable under 35 U.S.C. 103(a) over Pelekhaty in view of Rancourt; and whether the subject matter of claim 7 is patentable under 35 U.S.C. 103(a) over Pelekhaty in view of Rancourt and Mitsui.

### **GROUPING OF CLAIMS**

The pending claims 1-3 and 7-14 do NOT stand or fall together. The corresponding reasons are stated in the following Argument For Allowance.

### **ARGUMENT FOR ALLOWANCE**

#### **The Rejection**

The position taken by Examiner in the final Office action is understood, in summary, to be as follows. Examiner states that Pelekhaty teaches a thin film filter

for DWDM comprising a glass substrate (200), a film stack comprising a plurality of cavities (178, 182, 180; Fig. 11) wherein each cavity comprises a first mirror layer (194 for cavity 180) and a second mirror layer (176 for cavity 180) on the glass substrate comprising low refractive index thin films (68) and high refractive index thin films (66), by stating that one film has a high refractive index and the other film has a low refractive index Pelekhaty inherently states that a substantial difference exists between the refractive index of the alternating layers. Examiner further states that Pelekhaty teaches the use of zirconium oxide (col. 5, line 29), and Rancourt teaches that indium tin oxide may be substituted for zirconium oxide (col. 4, line 20-22) as a high refractive index layer. Thus Examiner asserts that the combination of Pelekhaty and Rancourt renders the invention obvious.

#### Reasons for Claims Being Separately Patentable

Claims 1-3 and 8-10 have the features of “both of the first mirror layer and the second mirror layer including low refractive index thin films and high refractive index thin films, and wherein each of the high refractive index thin films comprises a composition of indium-tin oxide having [a] high refractive index such that a substantially different refractive index between the low refractive index thin films and the high refractive index thin films is formed,” which are not disclosed in any other claims of the present application except for claim 7.

Claims 7 has the feature of “a range of the composition of indium-tin oxide is from 20% indium oxide plus 80% tin oxide to 17% indium oxide plus 83% tin oxide,” which is not disclosed in either Pelekhaty or Mitsui, and is not defined in any other claims of the present application.

Claims 11-14 define “each of the high refractive index thin films comprises a composition of indium-tin oxide having a refractive index of about 2.1, numbers

of the layers in the five cavities being about 160.” This feature is not disclosed in any other claims of the present application either.

Therefore, the pending claims do not stand or fall together.

### The Patentability of the Claimed Subject Matter

Applicant respectfully, but vigorously, disagrees with the rejection of claims 1-3 and 7-14 contained in the final Office action. Specifically, the position of Applicant is as follows:

### References Being In Non-Analogous Fields for Claim 1

Regarding claim 1, firstly, the Pelekhaty and the Rancourt references belong to two separate specialized fields of endeavor not related to each other. The Pelekhaty reference relates to a Fabry-Perot optical filter for channel selection in Wavelength Division Multiplexing systems, and Rancourt relates to a filter assembly for improving the image of a cathode ray tube or other luminous display. Rancourt teaches the filter assembly being for use with cathode ray tubes and other self-luminous displays whereby reduced glare and improved image contrast are realized (column 1, lines 62-64). Light can transmit through a filter assembly, whereas light with a particular wavelength cannot be filtered. The optical filter of Pelekhaty is for filtering a light with a particular wavelength, and belongs to the field of optical transmission communications. Therefore, the two cited references respectively belong to two different and nonanalogous arts. It would not be proper to combine these two disparate cited references, since they are from unconnected fields and are thus unobvious to combine.



### Lack of Teaching Combination of References for Claim 1

Secondly, there is no suggestion or motivation in either of the Pelekhaty or Rancourt references that they be combined with each other. Applicant notes that in Examiner's conclusion of unobviousness on page 3, lines 4-7 of the Office action mailed June 4, 2004, the purpose is stated to be to provide a film with low resistance to light transmission and high scratch resistance. However, the purpose of providing the filter of the present invention having high refractive index thin films with indium-tin oxide, is that the structure of the filter can have a reduced number of layers and can eliminate internal film stress (see, e.g., para. [0005] and page 5, lines 15-18 of the specification). There is no hint, suggestion or teaching in either of the two cited references that a film with indium-tin oxide used in a filter can reduce the number of layers and eliminate internal film stress of the filter. Pelekhaty is directed to providing a Fabry-Perot filter with particular transmission and reflection capabilities (col. 2, lines 25-30). Rancourt is directed to providing a filter assembly for improving the image of a cathode ray tube or other luminous display. The motivation for providing the novel structure of the optical filter of the present invention having the above-described advantages cannot be found in either Pelekhaty or Rancourt. This motivation resides only with the present inventors, as evidenced in the specification filed. Therefore it would not have been obvious for one of ordinary skill in the art to combine Rancourt with Pelekhaty for the purposes of arriving at the present invention.

### Novel Structure Resulting In Unexpected And Surprising Advantages for Claim 1

Thirdly, claim 1 recites: (I) the thin film filter including a glass substrate and a film stack with a plurality of cavities; and (II) each cavity having a first mirror layer, a second mirror layer, and a spacer located between the first and second mirror layers.

On page 2, lines 14-15 of said Office action, Examiner states that the filter of Pelekhaty comprises a glass substrate 200 and a film stack with a plurality of cavities 178, 182, 180 (Fig. 11). Examiner also states that the cavity 180 comprises a first mirror layer 194 and a second mirror layer 176. However, the cavity 180 as designated by Examiner does not have a spacer located between the first and second mirror layers 194, 176 (see also Fig. 10). Applicant asserts that the element 180 cannot be interpreted to be both a cavity and a spacer. Therefore, at best, the filter of Pelekhaty only reads on limitation (I) of claim 1. Rancourt only teaches a composition of indium-tin oxide used in an optical component. Rancourt fails to disclose a component reading on either of the limitations (I) and (II) of claim 1. In these circumstances, it is unobvious to derive a filter meeting both the limitations (I) and (II) from Pelekhaty in view of Rancourt.

In summary, the filter defined in claim 1 is patentable over the prior art. Therefore claim 1 should be in a condition for allowance.

#### References Being In Non-Analogous Fields for Claim 11

Regarding claim 11, firstly, the two cited references respectively belong to two **different and non-analogous fields and cannot properly be combined**, as asserted above with respect to claim 1.

#### References Not Teaching Or Suggesting The Combination Claimed for Claim 11

Secondly, **neither of the cited references contains a hint, suggestion or teaching that a film with indium-tin oxide used in a filter can reduce the number of layers and eliminate internal stress of the filter**, as asserted above with respect to claim 1.

### Claimed Features Being Not Mere Duplications Of Reference Material for Claim

#### 11

Thirdly, the cited references fail to disclose, teach or suggest the refractive index of the high refractive index thin film (2.1), the number of cavities (5), and the number of layers (160). Examiner states the limitation of the number of cavities and the number of layers are an obvious duplication of known parts of the Pelekhaty reference. Applicant acknowledges that mere duplication in comparison with the prior art may not be patentable. However, applicant asserts that the present invention is not a “mere” duplication of prior art. A person of ordinary skill in the art knows that the number of cavities and layers of an optical filter materially affects the optical performance of the optical filter. Generally, the more layers an optical filter has, the narrower the pass bandwidth is. Generally, the more layers the optical filter has, the greater the attenuation. It is incumbent on one skilled in the art to select a particular number of layers that reconciles the usually competing objectives of narrow pass bandwidth and low attenuation in order to optimize the optical performance of the optical filter. That is, generally, both a relatively narrow pass bandwidth and relatively low attenuation are desired. Thus, the number of layers of the optical filter of the present invention is not a mere duplication of known art, but rather a deliberately calculated result. Therefore, the number of cavities (5) and the number of layers (160) cannot be obviously derived from the two cited references by simple duplication.

### Novel Structure Resulting In Unexpected And Surprising Advantages for Claim 11

Fourthly, the filter defined in claim 11 produces *unexpected and surprising* advantages, as asserted above with respect to claim 1.

In summary, the filter defined in claim 11 is patentable over the prior art. Therefore claim 11 should be in a condition for allowance.

Since dependent claims 2-3, 7-10 and 12-14 directly or indirectly depend from independent claims 1 and 11 respectively, they are also believed to be patentable. And if further argument is needed, applicant further details the position as follows:

#### Lack of Teaching Combination of References for Claims 2 and 12

Regarding claims 2 and 12, Examiner states that Adair teaches the use of a coupling film 718 and the coupling film adjoins an adjacent cavity of the plurality of cavities (FIG. 7A), and that therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to include the coupling film of Adair in the Pelekhaty invention for the purpose of coherently coupling light between the successive cavities. Applicant traverses Examiner's reasoning as follows:

Examiner states that Adair teaches the use of a coupling film 718 and the coupling film adjoins an adjacent cavity of the plurality of cavities. However, the coupling film of the present invention adjoins an adjacent cavity of the plurality of cavities of the filter. The coupling film is an element of the filter; cf. the coupling film 718, which is a part of the optical switch. Even though a filter and an optical switch are components used in optical communications, the structure and function of the filter and of the optical switch are significantly different. There is no hint or suggestion to apply an element of an optical switch to a filter.

In any event, claims 2 and 12 respectively depend from claims 1 and 11, which are asserted to be allowable as detailed above. Therefore, claims 2 and 12 should be in a condition for allowance.

Regarding claims 3 and 13, these claims respectively depend from claims 2 and 12. Therefore, claims 3 and 13 should be in a condition for allowance.

### Lack of Teaching Combination of References for Claims 8 and 14

Regarding claims 8 and 14, Examiner states that Pelekhaty in combination with Rancourt teaches the invention as claimed but lacks reference to the low refractive index material being silicon or aluminum oxide, and that Adair teaches the use of silicon as the low refractive index material in combination with indium tin oxide as the high refractive index material.

However, there is no suggestion in any of the cited references that the combination of silicon oxide with indium tin oxide can be employed to solve the problem of internal film stress in an optical filter. In general, due to the multilayer design and film deposition process of multiple cavities in a film stack, the internal film stress is very high, which makes it extremely difficult to contain insertion loss in the film stack. The present invention has overcome this serious problem in optical filters by utilizing indium-tin oxide in the high refractive index material, which is not suggested in any of the cited references or any combinations thereof. Therefore, claims 8 and 14 should be considered as unobvious and should be in a condition for allowance.

Regarding claim 9, since claim 9 depends from claim 8, claim 9 should likewise be allowable.

Regarding claim 10, since claim 10 depends from claim 9, claim 10 should likewise be allowable.

### Lack of Teaching Combination of References for Claim 7

Regarding claim 7, this claim depends from claim 1, which is asserted to be allowable as detailed above. Therefore claim 7 should likewise be patentable.

If further argument is needed, the compound defined in claim 7 is a mixture of indium oxide and tin oxide. However, Mitsui teaches the compound having an

indium content being between 0.1 and 30 percent and a gallium content being between 0.1 and 30 percent. A person of ordinary skill in the art cannot derive the compound of the present invention from Mitsui. Firstly, the composition of the compound is different. The composition of the compound in Mitsui comprises indium and gallium. The composition of the compound of claim 7 comprises indium oxide and tin oxide. Secondly, the percentages are substantially different in scope. The compound of Mitsui has an indium content of 0.1-30 percent and a gallium content of 0.1-30 percent. The compound of the present invention ranges from 20% indium oxide plus 80% tin oxide to 17% indium oxide plus 83% tin oxide. The broad range of indium oxide provided by Mitsui is for the purpose of providing a thin film having a low *electrical* resistance. However, there is no suggestion in Mitsui that a narrower range within the broad range could yield desired high refractive index *optical* properties. There is no suggestion or motivation in Mitsui or any of the cited references to apply a mixture of indium oxide and tin oxide with a predetermined percent in order to obtain the filter as claimed.

### CONCLUSION

In conclusion, the non-obviousness of the instant invention is reasoned as follows:

- (1) The primary two references, Rancourt and Pelekhaty, belong to two different fields.
- (2) There is no suggestion or motivation to combine these two references. When a rejection depends on a combination of prior art references, the PTO must show that there is some teaching suggestion, or motivation to combine the references. In re Geiger, 815 F.2d 686, 688, 2USPQ2d 1276, 1278 (Fed. Cir. 1987). A conclusion of obviousness may be based on a

combination of references only where there is some reason, suggestion, or motivation to combine those references to arrive at the claimed invention. In re Dembiczak, 175 F.3d at 999, 50 USPQ2d (BNA) at 1617 (Fed. Cir. 1999).

- (3) None of the cited references address **the problem**, i.e., *elimination of internal film stress*, and needless to say **the solution**, i.e., *reduction of the layers by means of usage of indium-tin oxide*. The mere fact the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification. In re Fritch, 972 F.2d 1260, 1266, n.14, 23 USPQ 2d 1780, 1783-84 n.14 (Fed. Cir. 1992). Without such a motivation, no obviousness could be concluded in the instant application.
- (4) The Examiner believes that disregarding/ignoring the fact of “decreased internal stress” is proper because (I) such a functional limitation is not shown in the claims and (II) no evidence has been supplied to suggest unexpected results (office action, page 7). Even though no functional limitation is fully cited in the claims, the structure defined in claims inherently owns this advantage theoretically and practically. Also referring to the specification, page 2, paragraph [0004], lines 6-11, paragraphs [0005], [0006] and [0007], it evidentially shows the invention performs and should perform elimination of internal stress, otherwise listing such disadvantages of the prior art makes no sense. Accordingly, the Examiner rejection’s basis is improper. Moreover, as mentioned in (3) above, nowhere in the cited references disclosing or suggesting “desirability of elimination of internal stress” refers to no motivation for combination and concludes non-obviousness.
- (5) “One way for a patent applicant to rebut a prima facie case of obviousness is to make a showing of ‘unexpected results’, i.e., to show that the claimed invention inhibits some superior property or advantage that a person of ordinary skill in the relevant art would have found surprising or

unexpected.” In re Soni, 54 F.3d 746, 750, 34 USPQ2d 1684, 1687 (Fed. Cir. 1995). The instant invention uses the less layers for elimination of internal film stress while even achieving the superior isolation property, thus owing the unexpected results/advantage (referring to paragraphs [0004] and [0022]).

- (6) “It is impermissible to use the claimed invention as instruction manual or “template” to piece together the teachings of the prior art so that the claimed invention is rendered obvious. This court has previously stated that “[o]ne cannot use hindsight reconstruction to pick and choose among isolated disclosure in the prior art to deprecate the claimed invention” In re Fritch, 972 F.2d 1260, 1266, 23 USPQ2d 1780, 1784 (Fed. Cir. 1992).

Based upon the foregoing (1)-(6), Applicant’s claims 1-3 and 7-14 are directed to subject matter patentable over the Pelekhaty and the Mitsui references.

For the above reasons, Applicant respectfully requests that Examiner’s rejection of claims 1-3 and 7-14 be withdrawn, and that these claims now pass to issue.

Respectfully submitted,  
Charles Leu et al

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## APPENDIX

1. A thin film filter for dense wavelength division multiplexing, the thin film filter comprising:

a glass substrate; and

a film stack mounted on the glass substrate, the film stack comprising a plurality of cavities; wherein

each cavity comprises a first mirror layer, a second mirror layer, and a spacer layer arranged therebetween, both of the first mirror layer and the second mirror layer including low refractive index thin films and high refractive index thin films, and wherein each of the high refractive index thin films comprises a composition of indium-tin oxide having high refractive index such that a substantially different refractive index between the low refractive index thin films and the high refractive index thin films is formed.

2. The thin film filter as described in claim 1, wherein the film filter further comprises a coupling film, and the coupling film adjoins an adjacent cavity of the plurality of cavities.

3. The thin film filter as described in claim 2, wherein the coupling film is made of a material having a relative low refractive index.

7. The thin film filter as described in claim 1, wherein a range of the composition of indium-tin oxide is from 20% indium oxide plus 80% tin oxide to 17% indium oxide plus 83% tin oxide.

8. The thin film filter as described in claim 1, wherein the low refractive index thin films comprise silicon dioxide ( $\text{SiO}_2$ ) or aluminum oxide ( $\text{Al}_2\text{O}_3$ ).

9. The thin film filter as described in claim 8, wherein the low refractive index thin films and the high refractive index thin films are alternately deposited one on another.

10. The thin film filter as described in claim 9, wherein each of the low refractive index thin films and each of the high refractive index thin films has an optical thickness equal to one-quarter of a central wavelength of a pass bandwidth of the thin film filter.

11. A thin film filter for dense wavelength division multiplexing, the thin film filter comprising:

- a glass substrate; and

- a film stack mounted on the glass substrate, the film stack comprising five cavities, each cavity having a plurality of layer, and each layer comprising low refractive index thin films and high refractive index thin films; wherein

- each of the high refractive index thin films comprises a composition of indium-tin oxide having a refractive index of about 2.1, and numbers of layers in five cavities are about 160.

12. The thin film filter as described in claim 11, wherein the film filter further comprises a coupling film, and the coupling film adjoins an adjacent cavity.

13. The thin film filter as described in claim 12, wherein coupling film is made of a material having a relative low refractive index.

14. The thin film filter as described in claim 13, wherein the low refractive index thin films comprise silicon dioxide ( $\text{SiO}_2$ ) or aluminum oxide ( $\text{Al}_2\text{O}_3$ ).